Study Guide
Relativity - Chapter 2

With the exception of 4 vectors, the material covered in the lectures is summarized on pages 77 and 78 of the text.

Regarding 4 vectors, we identified two of these objects

$$\begin{aligned} x^\mu &= (ct, x, y, z) \\ p^\mu &= (E/c, p_x, p_y, p_z) \end{aligned}$$

and defined the Lorentz invariant scalar product as

$$x \cdot x = c^2t^2 - x^2 - y^2 - z^2 \quad p \cdot p = E^2/c^2 - p_x^2 - p_y^2 - p_z^2.$$

We know that in systems related to one another by a Lorentz transformation

$$x' \cdot x' = x \cdot x \quad p' \cdot p' = p \cdot p.$$

It is possible to add 4 vectors, and we can form $p + p'$ whose square, $(p+p') \cdot (p+p')$, for colliding particles is the square of the energy in the center of mass. We can also form $\Delta s^\mu = x_2^\mu - x_1^\mu$. This defines the space-time interval between the events and $\Delta s \cdot \Delta s$ is also and invariant quantity.

A lightyear is a unit of distance: the distance light travels in a year.

An electron Volt is an energy: the kinetic energy a single electron would gain if it were accelerated through a potential difference of one Volt: U = $q_e \Delta V$, so 1 eV = 1.6 E-19 J.

One final comment: have a look at the Questions at the end of Chapter 2, and the Conceptual Examples. Be able to explain how Special Relativity differs from Newtonian Mechanics. You may be asked some more-conceptual questions about use of frames of reference, simultaneity, or analysis of a Gedanken experiment as MC or TF questions which not as calculational as those in the practice exam included here.